

Claims

1. A glass plate cutting machine to generate a scribe line on the glass plate and then break the plate, comprising:

5 a cracking unit to provide a micro-crack at a cutting initiation point of a glass plate;

an irradiation unit to irradiate at least one laser beam, which is absorbed in the glass plate, to the glass plate to heat the glass plate, and including a first carbon dioxide laser beam irradiation part;

10 a cooling unit to cool the glass plate by use of a cooling fluid after irradiation of the at least one laser beam, and including a first cooling part; and

a breaking unit to break the glass plate,

15 wherein the first carbon dioxide laser beam irradiation part and the first cooling part disposed at the rear of the first carbon dioxide laser beam irradiation part are used to generate the scribe line while a plane irradiation density is controlled in a range of 0.05-2 joule/mm² on an irradiation area of 20-200 mm² by a first control part.

2. The machine as defined in claim 1, wherein the breaking unit comprises a second carbon dioxide laser beam irradiation part, and thus is used to break the glass plate while a volume irradiation density is controlled in the range of 0.1-0.5 joule/mm³ on the irradiation area of 20-200 mm² by a second control part.

3. The machine as defined in claim 2, further comprising a second cooling part by a cooling fluid disposed at the rear of the second carbon dioxide laser beam irradiation part.

25 4. The machine as defined in any one of claims 1 to 3, wherein the second control part functions to decrease the volume irradiation density of the breaking unit to 10-60% at an area between the cutting initiation point of the glass

plate and a point of 10-150 mm upon an initial cutting.

5 5. The machine as defined in claim 4, wherein the second control part functions to control irradiation intensity of the initial cutting and after the initial cutting in a continuous curvilinear manner or two or more stepped manner when the irradiation intensity of the breaking unit decreases to 10-60% upon the initial cutting.

6. The machine as defined in any one of claims 1 to 5, wherein the plane irradiation density or the volume irradiation density is controlled by adjusting at least one of an output, an irradiation area and a transfer rate of the irradiation unit.

10 7. The machine as defined in claim 6, further comprising a synchronizing unit acting to change the output of the irradiation unit in proportion to the transfer rate of the irradiation unit, so as to control the output and the transfer rate of the irradiation unit.

15 8. The machine as defined in any one of claims 1 to 5, wherein the cooling fluid of the cooling unit comprises water.

9. The machine as defined in any one of claims 1 to 5, further comprising a vacuum suction machine of the fluid disposed at the direct rear of the cooling unit.

20 10. The machine as defined in any one of claims 1 to 5, wherein the cracking unit comprises a notching cracker made of an ultra-hard material, or a laser cracker serving to collecting a pulse laser of Nd:YV04 by a light collector, followed by irradiating.

11. A display panel manufactured by cutting a glass plate by use of the glass plate cutting machine of any one of claims 1 to 5.